THE SHUTTLE RADAR TOPOGRAPHY MISSION (SRTM): A BREAKTHROUGH IN REMOTE SENSING OF TOPOGRAPHY

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The Shuttle Radar Topography Mission (SRTM), flown on the Space Shuttle Endeavour on Flight STS-99 and launched on 11 February 2000, had as its primary objective to acquire a high resolution digital topographic map of the Earth's land mass between 60 degrees North and 56 degrees South latitude. This mission represents a breakthrough in the technology of acquiring digital elevation information by demonstrating, for the first time in space, the technology of single pass synthetic aperture radar interferometry. The SRTM mission also demosntrated the firt time use in space of a 60 m long mast that was used to form the baseline of the radar interferometer.

SRTM will produce maps of the Earth that will be at least one order of magnitude more precise in the elevation resolution, and will have postings of 30 m, representing an order of magnitude increase in the density of the postings over currently available data. Digital topographic information is crucial to scientific investigations in geology, geophysics, hydrologic modeling, and ecology. This type of data also forms the basis for monitoring the surface deformation during earthquakes, inflation of volcanoes, and flood inundation monitoring. In the civil sector, this type of data could be used for urban planning and the design of transportation infrastructure.

This paper will provide a description of the mission, with results of the coverage achieved. We will also present an early assessment of the data quality and show some early results from the mission. In particular, we will address the application of interferometrically derived digital elevation data to modeling of hydrologic parameters such as flow accumulation and watershed identification. In radar interferometry, phase difference values are measured and translated to elevation information using information about the platfrom position and baseline length and attitude. The interferometric phase noise then results in a high frequency noise on the elevation values. In addition, areas with excessive phase noise may not be unwrapped, leading to holes in the digital elevation models. We will show how this noise needs to be considered when conditioning the digital elevation models prior to calculation of flow directions and flow accumulations.